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"Ab initio" development of a gaseous Compton Camera

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Compton Cameras are being pointed as the instrument for far X and gamma-ray detection where the traditional Anger Cameras are inefficient. Moreover, these devices avoid the use of a heavy mechanical collimator responsible for a huge decrease of the photons that reach the Anger Camera crystal [1], [2].
Traditionally a Compton Camera is composed of solid state detectors (Si detector + Ge or NaI detector)[3]. Our proposal is to use a single High Pressure Scintillation Counter for the Compton and scattered photon interactions, based on Bolozdynya setup [4], by changing the high cost and low position resolution PMT array by a low cost gaseous photomultiplier with energy resolution and position discrimination capability: THCOBRA [5].
In this work we present the initial characterization of the high pressure gas scintillation proportional counter (HpGSPC) for pure Xenon pressures ranging from 1- to 5 atm. The optical gain and energy resolution as function of the drift and scintillation fields where studied by using a PMT achieving energy resolutions below 4% for 59.6 keV photons.
Calculation of the number of primary electrons and intrinsic position resolution will be presented as function of the gas pressure.
A detailed discussion of the experimental measurements and a comparison with simulation results is performed.
Results and details on the coupling of a gaseous photomultiplier based on a THCOBRA and operating in Ne/CH4 will be presented.

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